Polygraph Evidence Evaluator

Examiner User Guide

Version 1.0

The Centre for Forensic Neuroscience Credibility Systems

Purpose

The Polygraph Evidence Evaluator is a professional documentation and analytical tool designed to assist examiners in translating Empirical Scoring System (ESS) results into a transparent Bayesian framework.

The tool is not intended to determine deception, truthfulness, guilt, innocence, admissibility, or legal liability. It is designed to document assumptions, evidential weighting, Bayesian updating, and examiner reasoning in a structured and transparent manner.

The evaluator supports:

- ESS result documentation
- ESS-M published table lookup
- Bayesian probability updating
- Prior probability documentation
- Evidential impact assessment
- Sensitivity analysis
- Professional report generation

Conceptual Framework

The evaluator follows the following sequence:

Prior Probability

↓

Polygraph Evidence

↓

Likelihood Ratio / Bayes Factor

↓

Posterior Probability

↓

Professional Interpretation

The tool does not replace examiner judgement.

Section 1 – Case Details

Record:

- Case reference
- Examinee name
- Examiner name
- Examination date
- Report date
- Examination type

The examiner notes section should document:

- Scope of review
- Limitations
- Relevant assumptions
- Any unusual features of the examination

Section 2 – ESS Inputs

Enter the information reported by the ESS software.

ESS Model

Select the applicable model:

- 2Q Diagnostic
- 3Q Diagnostic
- 4Q Diagnostic
- Multi-Issue
- Multi-Facet
- ESS-M / Multinomial

Grand Total Score

Enter the final ESS Grand Total Score.

Examples:

- -12
- -7
- +5
- +14

ESS Classification

Select:

- DI
- NDI
- INC

Additional ESS Information

Where available enter:

- Decision rule
- Number of charts
- Relevant questions
- Cut scores
- Alpha values
- Lowest relevant score

Section 3 – ESS Report Import Assistant

The import assistant allows extraction of information from ESS report text.

Procedure:

1. Copy report text.
2. Paste into the import window.
3. Select "Extract Values".
4. Review extracted fields.
5. Confirm accuracy against the original report.

The import assistant does not:

- Read PDFs directly

- Perform OCR
- Replace examiner review

All imported values must be checked manually.

Section 4 – ESS Evidence Weight Engine

The evaluator offers three methods.

Method A – Manual LR

The examiner enters a likelihood ratio manually.

Use when:

- Independent research supports the LR.
- A case-specific evidential weighting approach is preferred.

Method B – Published ESS-M Table

This is the preferred method when ESS-M data are available.

The published ESS-M table converts:

Grand Total Score

↓

Published Posterior Odds

↓

Applied Bayes Factor

↓

Posterior Probability

Example:

Grand Total = -12

Published Odds = 12.07

Applied LR = 12.07

Direction: Deception-supporting

Method C – Provisional Conservative Lookup

This method is intended for demonstration and educational purposes only.

It should not replace validated ESS normative data.

Understanding ESS-M Table Values

The published ESS-M table contains:

- Posterior odds
- Posterior probabilities
- Lower limits of credible intervals

For ESS-M scores:

Negative scores support the deception hypothesis.

Positive scores support the truthfulness hypothesis.

Score 0 is neutral.

Examples:

Score -6

Published odds = 3.2

Applied LR = 3.2

Score +6

Published odds = 3.2

Applied LR = 1 / 3.2

Applied LR = 0.3125

This reduces deception odds.

Examiner Override

The examiner may override the suggested evidential weight.

When overriding:

- Record the reason.
- Document supporting rationale.
- Explain why the default value was unsuitable.

Overrides should be exceptional rather than routine.

Section 5 – Prior Probability

The prior probability reflects the probability assessment before considering the polygraph evidence.

Sources may include:

- Base rates
- Case facts
- Research-derived estimates
- Examiner judgement
- External assessment

The rationale should explain:

- Why the prior was selected
- Sources relied upon
- Areas of uncertainty

Selecting Priors

Example:

Neutral position:

Prior = 50%

Case facts strongly favour deception:

Prior = 75%

Case facts strongly favour truthfulness:

Prior = 25%

The evaluator does not determine the prior.

The examiner remains responsible for prior selection.

Section 6 – Bayesian Evidence Settings

The evaluator converts:

Prior Odds

×

Likelihood Ratio

=

Posterior Odds

Posterior Odds are then converted to Posterior Probability.

Example:

Prior = 50%

Prior Odds = 1

LR = 12

Posterior Odds = 12

Posterior Probability = 92.3%

Section 7 – Evidential Impact

The tool reports:

- Prior probability
- Posterior probability
- Percentage-point shift
- Evidential impact category

Categories include:

- Negligible
- Weak
- Moderate
- Strong
- Very Strong

These categories describe evidential impact only.

They do not determine truthfulness or deception.

Section 8 – Decision Utility Settings

Decision utility settings allow the examiner to document:

- False positive costs
- False negative costs
- True positive utility
- True negative utility

These settings do not affect ESS scoring.

They are intended to assist structured decision documentation.

Section 9 – Statistical Corrections

The evaluator records:

- Bonferroni correction
- Pairwise correction
- Independence assumptions

These are important where:

- Multiple relevant questions exist
- Multiple facets are analysed
- Multiple comparisons are performed

Failure to account for non-independence may inflate evidential weight.

Section 10 – Sensitivity Analysis

Sensitivity analysis demonstrates how conclusions change under alternative assumptions.

The evaluator automatically explores:

- Lower priors
- Higher priors
- Alternative evidence weights

This helps identify whether conclusions are robust.

Interpreting Posterior Probabilities

Posterior probabilities should be interpreted cautiously.

Example:

Posterior Probability = 85%

Correct:

"The evidence shifts the prior probability to approximately 85% under the assumptions entered."

Incorrect:

"The examinee is 85% deceptive."

The evaluator does not estimate the probability that a person is lying.

It estimates the posterior probability generated by the selected Bayesian model.

Report Generation

The generated report should be retained alongside:

- Original ESS report
- Polygraph charts
- Scoring worksheets
- Examiner notes
- Case documentation

The evaluator report supplements but does not replace original examination records.

Professional Limitations

The Polygraph Evidence Evaluator:

- Does not determine deception.
- Does not determine truthfulness.
- Does not determine guilt.
- Does not determine innocence.
- Does not determine admissibility.

Outputs are conditional upon:

- ESS inputs
- Prior probability assumptions
- Likelihood ratio assumptions
- Statistical correction settings
- Examiner judgement

Professional interpretation remains essential.

Recommended Workflow

1. Complete ESS scoring.
2. Generate ESS report.
3. Enter or import ESS values.
4. Select prior probability.
5. Review evidence weighting.
6. Review correction settings.
7. Examine sensitivity analysis.
8. Generate report.
9. Attach report to case file.

10. Retain original ESS documentation.

End of Manual